UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

MEMORANDUM

SUBJECT: Risk Assessment for Avermectin used on vegetables and other Field Crops, Nationwide

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With this memorandum, the EEB is apprising RD on our position regarding risk to nontarget organisms from the following crops.

Strawberries
Lettuce
Celery
Tomatoes
Cucurbits
Melons
Cucumbers
Squash
Peppers
Eggplants

In the past, the EEB has concluded that avermectin may represent risk to aquatic invertebrates. Risk to birds and fish was considered minimal. Acute risk to mammals was also considered minimal. Chronic risk to mammals was identified in past reviews[1]. The registrant has volunteered the following risk reducing measures:

-The use rate was limited to 0.02 lb ai/acre per application.
-The maximum seasonal use rate was limited to 0.057 lb ai/acre (except for strawberries which permits up to 0.08 lb ai/acre).
-Aerial application was not permitted.
-Do not make more than two applications in sequence.

[1] Reducing the overall use rate, and the number of sequential application mitigated that risk.

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Other factors about avermectin that affect risk include:

-Avermectin binds tightly to soil limiting availability
-Avermectin degrades fairly rapidly via photolysis

Factors about the proposed use sites that affect risk:

-Most fields containing these crops will tend to be well tilled and fairly level.
-Many of the sites either have sandy soil over which surface water is less likely to transport or have high organic content enhancing the likelihood that avermectin will bind and be less available to runoff with surface water.

Discussion of previous Reviews

In past reviews, the EEB has indicated the potential for risk to aquatic invertebrates. This was based on various screening and refined exposure estimates and various use scenarios. The exposure estimates provided from EFGB for use sites representing these crops and reflecting the most recent application restrictions have been qualitative, generally indicating negligible runoff potential but no actual estimated concentrations.

In later reviews, taking these and other factors into account and EFGB's qualitative assessment, the EEB concluded that for vegetables in Florida and the Western growing regions (California, Arizona and Texas) the amount of avermectin that may enter water bodies would be negligible. A similar conclusion was reached for Peppers, Tomatoes and Eggplants for nationwide use (review dated 1-12-94; D194892).

In the latest review (4-18-95), in order to obtain a numerical exposure estimate with which to calculate risk quotients, the EEB utilized a generic exposure model developed by Surface Water Section for EEB. The particular use site was identified as Hops; however, since the model is generic, and not site (crop) specific, the crop was not considered important. This model takes into account many environment fate characteristics, and bases the amount of runoff on the Koc value (derived from the Kd). That model resulted in following exposure estimates:

Instantaneous	4-day	21-day	56-day
89 ppt	37 ppt	7 ppt	3 ppt

Based on this, that review concluded that risk to invertebrates was possible.

2

Further Discussion of Risk

The acute risk quotients are presented below:

Species	89 ppt	37 ppt	7 ppt	3 ppt
Fish (LC50 =3200 ppt	0.03	0.01	<0.01	<0.01
Daphnia (EC50=220 ppt)	0.4	0.17	0.03	0.01
Shrimp (EC50=20 ppt)	**4.5**	**1.8**	0.35	0.15

Generally, if the risk quotient exceeds the LOC of 0.5, a presumption of high acute risk may be made. Based on the estimate, the LOC for acute risk to shrimp is exceeded for up to 4 days. Acute risk to other aquatic organisms is not anticipated.

However, the following should be considered when viewing these acute risk quotients. The exposure scenario was an enclosed waterbody receiving runoff from a immediately adjacent field. Shrimp, being estuarine, do not occur in enclosed water bodies. It is unlikely that this scenario is appropriate for this habitat. There is a high degree of uncertainty associated with this conclusion. It is likely that the actual exposure in a majority of cases would be less than this estimation, taking into account the various fate characteristics for avermectin, and the fact that most land around estuaries tends to have limited slope. Therefore, it is considered likely that impact to estuarine invertebrates would be minimal.

The chronic risk quotients are presented below:

Species	89 ppt	37 ppt	7 ppt	3 ppt
Fish (MATC = 700 ppt	<1	<1	<1	<1
Daphnia (MATC = 50 ppt)	**1.8**	<1	<1	<1
Shrimp (MATC = 5 ppt)	**18**	**7.4**	**1.4**	<1

3

If the risk quotient exceeds 1, chronic risk is considered a possibility. The LOC for sublethal or reproductive effects is exceeded for Daphnia (immediate concentrations) and shrimp (up to 21 days). In this case, also, certain factors, in addition to those above, should be considered:

1-For freshwater invertebrates, note that the LOC is exceeded only with the instantaneous concentration (89 ppt). The duration of the daphnia life cycle study which resulted in the MATC used for this chronic risk assessment was 21 days. There is no way of knowing how long exposure must continue at the MATC to result in adverse effects. However, with the exposure above the LOC only lasting a few days at most, the probability for significant adverse chronic effects is considered to be relatively low.

2-For estuarine organisms, based on this scenario, the LOC appears to be exceeded for up to 21 days. However, as with the acute risk discussion above, it is unlikely that exposure in actual estuarine habitats would approach these estimated levels. Therefore, the actual potential for chronic risk is considered very low.

Conclusion

Since exposure is considered to be variable, there is a possibility of some risk to freshwater and estuarine organisms under certain conditions. However, circumstances and fate characteristics of avermectin tend to reduce the actual potential for effects; and in most cases, the exposure and subsequent risk is considered negligible. Effects to endangered species are considered unlikely.

No additional risk reduction measures are recommended at this time.

If you have questions, please contact Dan Rieder or Ann Stavola.